REMARKS

Claims 1-21 were pending. Claims 1-21 were rejected under 35 USC §102(e) as being anticipated by McKnight (US Pat No. 6,144,353). In light of the amendments and the following remarks, the undersigned requests withdrawal of the rejections.

I. The Present Invention

The present invention relates to enhanced performance liquid crystal displays. In particular, the present invention discloses a method and apparatus for reducing the amount of time for "painting" pixels in a liquid crystal display.

As is described in the the invention typical liquid crystal material within a pixel has an asymmetric switching behavior. For example, when switching from a bright state to a dark state, the time may take about 1.5 milliseconds; and when switching back from the dark state to the bright state, the time may take about 3.5 milliseconds. P. 6, lines 1-7. This is also illustrated in Fig. 1B (tS is shorter than tR). Because of this asymmetric switching behavior, as illustrated in the example in Fig. 1A, to ensure the last pixel on the display has switched, one must wait until at least 4.5 milliseconds after the draw (paint) phase has begun. (1 millisecond before the last pixel is painted, and 3.5 milliseconds for the bright state transition).

To reduce the amount of waiting time, embodiments of the present invention include applying an initial (transition) voltage to all pixels on the display. P. 6, lines 23-29. This initial voltage is maintained on each pixel, until the paint voltage for each pixel overwrites the initial voltage. P. 6, lines 30-32.

An example of this is illustrated in Fig. 2. In this example, during the initialization time 200, the transition voltage is applied to all pixels to begin forcing all pixels to the bright state. Later, the actual value for each pixel is written into the pixels. As is shown, if the last pixel in the display should be the bright state, the paint voltage and the transition voltage will be both approximately the same. Notably, as is illustrated in Fig. 2, because, the transition to the bright state for the last pixel began at about time 0 (in response to the transition voltage), the last pixel is in the bright state at about 3.5 milliseconds. In contrast to Fig. 1A, in the example in Fig. 2, the response time of the display is reduced by about 22% ((4.5-3.5)/4.5 = 22%). This is a significant improvement in performance.

In one of the embodiments illustrated, the initialization of all pixel values is performed by using FLASHCLEAR 430 signal and FLASHVAL 440 value and simple switches, and charging the pixel capacitors accordingly, Fig. 4. Additional examples are illustrated in Fig. 6.

Claim 1, as amended, recites among other elements, applying a transition voltage to the plurality of pixel elements, each pixel element including a liquid crystal material having at least a first state and a second state, wherein a transition of the liquid crystal material from the first state to the second state has an associated first transition time, wherein a transition of the liquid crystal material from the second state to the first

state has an associated second transition time, wherein the first transition time is longer than the second transition time, and wherein the transition voltage induces liquid crystal material in each pixel element to begin transitioning to the second state.

Claim 6, as amended, recites, wherein applying the transition voltage to the plurality of pixel elements comprises applying the transition voltage to all of the plurality of pixel elements at one time while holding a common electrode at a constant value.

II. The Cited Reference

McKnight appears to relate to a display system where a display is quickly blanked out between frames. In particular, the control electrode is raised to quickly blank out all the pixels so that viewers cannot see the display during data updates. Col. 4, lines 28-30; col. 4, lines 45-46; col. 5, lines 5-7; and others.

The method for blanking the display is described in Fig.. 3A. Initially, the cover glass voltage (Vcg) is raised so that the "display frame is momentarily driven dark-Even if Pixel Data is Still Stored on the Pixel Electrode." step 204. In other words, all the liquid crystal material of all pixels are driven to a dark state. This is illustrated in Fig. 2D as 161, "Curve 161 illustrates the rapid drive to black." Col. 10, lines 54-55. This slope is quite steep.

Next, values of pixels are written into the pixel capacitors, step 206. However, despite the pixel data, the liquid crystal material is kept in the dark state. This is also part of time TL (t0-t1) in Fig. 2D. Col. 11, lines 1-5. "The pixel intensity is at its lowest as shown by curve 162." Col. 10., lines 59-60.

After all the pixel capacitors have been charged up, the cover glass voltage is dropped to a nominal voltage, step 208. Thus, only at this time do the liquid crystal material in each pixel begin to move to the proper state. Fig. 1D, time t1, 163. "[C]urve 163 which indicates the intensity of the pixel rising as the liquid crystal continues to relax." Col. 11, lines 10-12. Note this slope is not as steep.

In light of the above, it appears that during time period TL (t0-t1), the liquid crystal material is quickly transitioned into a dark state (161). However, after t1, the liquid crystal material is slowly transitioned into a bright state (163). Accordingly, at best, the McKnight display would appear to follow the prior art example illustrated in Fig. 1A. That is, bright-to-dark and dark-to-bright transitions begin at the same time.

III. The Cited Reference Distinguished

In response to the rejections of claims 1-21 as being anticipated by McKnight, the undersigned traverses all of the Examiner's rejections.

A. Claim 1

McKnight does not disclose, teach, or suggest all the limitations of Claim 1, as amended. For example, McKnight does not disclose applying a transition voltage to the plurality of pixel elements, each pixel element including a liquid crystal material having at least a first state and a second state, wherein a transition of the liquid crystal

material from the first state to the second state has an associated first transition time, wherein a transition of the liquid crystal material from the second state to the first state has an associated second transition time, wherein the first transition time is longer than the second transition time, and <u>wherein the transition voltage induces liquid crystal material in each pixel element to begin transitioning to the second state</u>.

In light of the above, it appears, McKnight, at best, appears to do <u>the exact opposite</u> of the element recited above. As shown, McKnight initially relies on the liquid crystal material <u>to quickly transition</u> (161) during time period TL to blank out the screen, and later, the liquid crystal material <u>slowly transitions</u> (162) after time t1. In contrast, as recited above in Claim 1, the transition voltage first induces liquid crystal material in each pixel element to begin transitioning to the second state (the slower state). The non-obvious advantages of this limitation are illustrated in the embodiments discussed above.

In sum, McKnight does not teach at least the above limitation of claim 1. Claim 1 is therefore asserted to be allowable for at least this reason.

<u>B. Claim 6</u>

McKnight does not disclose, teach, or suggest all the limitations of Claim 6, as amended. For example, McKnight does not disclose wherein applying the transition voltage to the plurality of pixel elements comprises applying the transition voltage to all of the plurality of pixel elements at one time <u>while holding a common electrode at a constant value</u>.

As disclosed above, McKnight appears to deliberately move the value of the common electrode to blank out the display during frames. The non-obvious advantages of this limitation are illustrated in the embodiments discussed above.

Accordingly, McKnight does not teach at least the above limitation of claim 6. Claim 6 is therefore asserted to be allowable for at least this reason.

<u>D. Remaining claims</u>

Claim 1 is asserted to be allowable for the above reasons. Claims 2-8 dependent on claim 1, are also asserted to be allowable for similar reasons as claim 1 and for the additional limitations they recite.

Claim 9 is asserted to be allowable for the above reasons as claim 1, among others. Claims 10-16, dependent from claim 9, are also asserted to be allowable for similar reasons as claim 9 and for the additional limitations they recite.

Claim 17 is asserted to be allowable for the above reasons, among others, as claim 1. Claims 18-21 dependent from claim 17, are also asserted to be allowable for similar reasons as claim 17 and for the additional limitations they recite.

Claim 6 is also asserted to be allowable for the above reasons. Claims 7-8, 14-16, and 20, are also asserted be allowable for similar reasons as claim 6 and for the specific limitations they recite.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

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